(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 646 663 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **94307254.6**

(22) Date of filing : **04.10.94**

(51) Int. Cl.[6] : **D01D 4/02**, D01D 5/098, D01D 5/32

(30) Priority : **04.10.93 JP 271327/93**

(43) Date of publication of application : **05.04.95 Bulletin 95/14**

(84) Designated Contracting States : **DE FR GB IT**

(71) Applicant : **Chisso Corporation**
6-32, Nakanoshima 3-chome
Kita-ku
Osaka-shi Osaka-fu (JP)

(72) Inventor : **Terakawa, Taiju**
1127-3, Koshinohara,
Yasucho
Yasu-gun, Shiga-ken (JP)

(74) Representative : **Lamb, John Baxter**
MARKS & CLERK,
57-60 Lincoln's Inn Fields
London WC2A 3LS (GB)

(54) A melt-blow spinneret device.

(57) A combined filaments type, melt-blow spinneret device comprises a spinning resin-feeding plate (2) having respective resin-introducing grooves (7a, 7b) for introducing two kinds of spinning resins ;

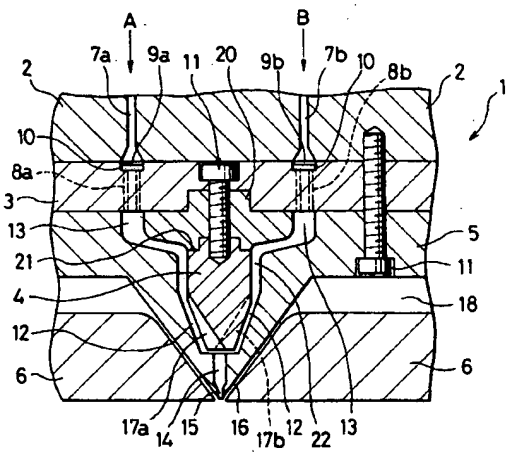
a distributing plate (3) attached to the spinning resin-feeding plate (2) and having a first major surface abutting a major surface of the spinning resin-feeding plate (2), said distributing plate (3) having distributing grooves (9a, 9b) for respectively distributing the spinning resins (A, B) fed from the resin-introducing grooves of the spinning resin-feeding plate ;

a nozzle plate (5) fixed to the distribution plate (3) and having a first surface abutting a second major surface of the distributing plate (3), said nozzle plate (5) having a cavity (22) for receiving a separating plate (4) therein and a plurality of holes (14) formed in a bottom interior surface of a downwardly-extending portion of the nozzle plate (5), said holes (14) opening towards the cavity and respectively communicating with a like plurality of spinning nozzles (15) formed in the downwardly-extending portion of the nozzle plate (5), said spinning nozzles opening away from the cavity ;

a separating plate (4) received in the cavity and attached to the second major surface of the distributing plate (3), said separating plate (4) having a lower part of nearly V-form cross-section and having separation grooves (17a, 17b) engraved from both the side portions to a bottom portion of said lower part, facing the plurality of holes (14) of the nozzle plate (5), for introducing the different spinning resins into the plurality of holes ;

a clearance-defining plate (6) having a V-shaped groove for receiving the downwardly-extending portion of the nozzle plate (5) therein, said clearance-defining plate (6) being arranged to provide a gas-introducing clearance (16) between the nozzle plate (5) and the clearance-defining plate (16) for stretching the combined resins using the introduced gas as the combined resins emerge from the spinning nozzles (15).

FIG. 1



EP 0 646 663 A1

This invention relates to a melt-blow spinneret device. More particularly it relates to a combined filaments type, melt-blow spinneret device wherein different spinning resins are respectively and separately extruded through different spinning nozzles, followed by subjecting the extruded unstretched filaments melt-blow spinning by a high-speed gas current. By means of the melt-blow spinneret device of the present invention, microfine combined filaments are processed into web, non-woven fabric or molded product to be used for mask, filter for precision filtration, battery separator, hygienic material, heat insulator, etc.

The so-called melt-blow spinning wherein a thermoplastic synthetic resin is extruded through spinning nozzle plates, accompanied by spouting a high speed gas onto the extruded unstretched filaments through clearances provided on both the sides of the spinning nozzle plate, can afford microfine filaments having a diameter of e.g. 10 μm or less, and also makes it possible to continuously carry out spinning and production of non-woven fabric. Hence, the above spinning is an advantageous process for producing a non-woven fabric of microfine filaments.

In recent years, a process of subjecting two different kinds of polymers to conjugate melt-blow spinning, a process of subjecting them to combined filaments type melt-blow spinning, and the like process have been proposed.

As to the so-called conjugate melt-blow spinning, Japanese patent application laid-open Nos. Sho 60-99057 and Sho 60-99058 disclose a side-by-side type, conjugate melt-blow spinneret device provided with conduits for introducing two kinds of polymers from the respective extruders, into holes connected to the conduits for combining conjugate components, and an air orifice, and a spinning process using the device. These patent applications disclose that it is possible to produce microfine filaments according to side-by-side type conjugate melt-blow spinning process, in combinations of various heterogeneous polymers such as polypropylene/polyester, polypropylene/nylon-6, etc.

In the case of the spinneret device and the production process of conjugate filaments, disclosed in the above patent applications, the objective microfine filaments can be obtained by controlling the temperature, the retention time of polymers inside the extruders, the polymer compositions, etc. so that the viscosities of polymers at the time of passing through the die can be similar. However, a production of uniform conjugate filaments is possible only in the case where control of the temperature, the retention time, inside high precision extruders, the polymer compositions, etc. are possible and the retention time of polymers inside the die is short and a die of a relatively small type is provided, without taking productivity into consideration.

Japanese patent application laid-open No. Hei 4-370210 discloses a combined filament type, melt-blow spinneret device wherein divided rooms of a first resin reservoir and a second resin reservoir are provided, and a first spinning nozzle and a second spinning nozzle obliquely bored from the bottom parts of the rooms toward tapered tip ends of the nozzles, for leading the respective spinning resins are provided. In the case of this device, the tip end width of the nozzles is made specified, whereby the obliquely spun filaments are perpendicularly turned by the time of the contact of the filaments with a high speed gas current, followed by contacting with the gas current is a state where molted resins have been somewhat solidified. Hence, combined filaments spinning is possible without any fiber breakage or shot.

However, according to such a conventional device, the spinning direction of filaments is persistently oblique and contact of the filaments in the molted state just below the tip end of nozzle piece, with the accompanying gas current generated by the high speed gas current is asymmetric. Thus, a turbulent gas flow is liable to occur at the tip end part of the nozzle piece. Namely, there is raised a problem that insufficient stretching due to the turbulent gas current occurs to cause blocking between filaments, resulting in occurrence of filament aggregate. In particular, as the filament-combining ratio becomes 2/1, 3/1, etc. apart from 1/1, contact of the high speed gas current with the spun filaments of the respective components becomes non-uniform and irregular to cause blocking between the filaments of the same kind or different kinds, whereby a large quantity of filament aggregate is liable to occur.

Further, conventional apparatuses are effective only in the case where they are provided so as to carry out blow spinning in the vertical direction. Hence, the apparatuses have a drawback that the above-mentioned phenomenon becomes more notable in the case where they are provided so as to carry out blow spinning in the oblique or lateral direction.

Further, according to conventional devices, since spinning nozzles are obliquely bored in one nozzle plate block, the length of the spinning nozzles cannot help becoming larger than that of spinning nozzles bored in the vertical direction, whereby it is difficult to bore spinning nozzles with good precision and cheaply. Still further, in the case of the above devices, when they are reassembled and reused after burning, ultrasonic washing, etc. after spinning, the spinning nozzles are so long in the length direction that removal of extraneous matters adhered onto the wall thereof is liable to be insufficient, resulting in extrusion unevenness and extrusion of spiral filaments at the respective spinning nozzles, to make it difficult to spin uniform filaments. In order to solve such problems, if the spinning nozzles are shortened, the resin pressure exerted onto the spinning nozzles lowers, so that this cannot correspond to a combination of heterogene-

ous polymers in a broad range wherein the viscosity and the physical properties are varied. Further, there are dangers that distortion or cracks occur at the tip end part of the nozzle plate block. This becomes more notable when the nozzle plate width is broaded or the number of the spinning nozzles is increased; such a device cannot be regarded as a device taking productivity into account.

Further, according to the conventional devices, when the combining proportions of the respective components is changed, a plural number of nozzle plates corresponding to the respective combining proportions are required. Hence, a problem has been raised that an expensive device should be indispensably employed.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a combined filaments type melt-blow spinneret device which can correspond to a broad range of combinations of heterogeneous polymers having different viscosities and physical properties, and yet which can produce filaments having few filament aggregates and filament unevenness.

Another object of the present invention is to provide a melt-blow spinneret device which can correspond to optional filament-combining proportions of heterogeneous polymers, without exchanging an expensive nozzle plate, but by exchanging only a cheap separating plate when the proportions are changed, and wherein the inner cavity of the nozzle plate, the separating plate, etc. are hardly damaged.

Still another object of the present invention is to provide a melt-blow spinneret device having a nozzle plate of a broad width in the length direction and a superior productivity.

Further, still another object of the present invention is to provide a device which can carry out blow-spinning not only in the vertical direction, but also in an optional direction.

BRIEF DESCRIPTION OF THE DRAWINGS OF THE INVENTION

Fig. 1 shows a front, schematic, cross-sectional view of the spinneret device for conjugate melt-blow spinning.

Fig. 2 shows an enlarged, cross-sectional view of the lower part of the nozzle plate of Fig. 1.

Fig. 3 shows a view illustrating the relationship between the bottom surface of the separating plate and the bottom surface of the nozzle plate (combined filaments proportion: 1/1).

Fig. 4 shows a view illustrating the relationship between the bottom surface of the separating plate and the bottom surface of the nozzle plate (combined filaments proportion: 2/1).

Fig. 5 shows a view illustrating the relationship between the bottom surface of the separating plate and the bottom surface of the nozzle plate (combined filaments proportion: 1/1).

Fig. 6 shows a view illustrating the relationship between the bottom surface of the separating plate and the bottom surface of the nozzle plate (combined filaments proportion: 2/1).

Fig. 7 illustrates a view of the side surface of the separating plate.

Fig. 8A shows combined microfine filaments of single component filaments with each other.

Fig. 8B shows combined microfine filaments of single component filaments with side-by-side conjugate filaments having different component proportions.

Fig. 8C shows combined microfine filaments of single component filaments with partly conjugated filaments.

Description of the symbols in the figures: 1: combined filaments type spinneret device for melt-blow spinning, 2: spinning melted resins-feeding plate, 3: distributing plate, 4: separating plate, 5: nozzle plate, 6: clearance-defining plate, 7a: groove for introducing spinning melted resin of component A, 7b: groove for introducing spinning melted resin of component B, 8a: hole for distributing the component A, 8b: hole for distributing the component B, 9a: groove for distributing the component A, 9b: groove for distributing the component B, 10: filter, 11: bolt, 12: groove for controlling the pressure of spinning melted resins. 13: groove for receiving the spinning melted resins, 14: spinning resin-introducing hole, 15: spinning nozzle, 16: clearance for gas spouting, 17a: groove for separating the component A, 17b: groove for separating the component B, 18: gas-introducing port, 19: separating portion wall, 20: top part of separating plate, 21: abutted face of separating plate, 22: inner cavity of nozzle plate, 23: A component filament, 24: B component filament, 25: partly conjugated filament, D1: narrow clearance between the bottom surface K of separating plate and the bottom surface X of nozzle plate, D2: depth of separating groove, W1: width of separating groove, W2: diameter of spinning resin-introducing hole, W3: narrow clearance between the nearly V-form side surface M of separating plate and the nearly V-form inner surface Y of nozzle plate, M: the nearly V-form side surface of the lower part of separating plate, Y: the nearly V-form inner surface of the lower part of nozzle plate, and K: bottom surface of separating plate.

DESCRIPTION OF PREFERRED EMBODIMENTS

The embodiments of the present invention will be described below referring to the accompanying drawings.

Fig. 1 shows the front schematic cross-sectional

view of the spinneret device for melt-blow spinning, and Fig. 2 shows the enlarged cross-sectional view of the lower part of the nozzle plate of Fig. 1.

This spinneret device is composed mainly composed of a spinning resin-feeding plate 2 having respective resin-introducing grooves 7a, b for introducing two kinds of spinning resins A and B;

a distributing plate 3 attached to the spinning resin-feeding plate 2 and having a first major surface abutting a major surface of the spinning resin-feeding plate 2, the distributing plate 3 having distributing grooves 9a, b for respectively distributing the spinning resins A, B fed from the resin-introducing grooves of the spinning resin-feeding plate 2;

a nozzle plate 5 fixed to the distributing plate 3 and having a first surface abutting a second major surface of the distributing plate 3, the nozzle plate 5 having a cavity 22 for receiving a separating plate 4 therein and a plurality of holes 14 formed in a bottom interior surface of a downwardly-extending portion of the nozzle plate 5, the holes 14 opening towards the cavity and respectively communicating with a like plurality of spinning nozzles 15 formed in the downwardly-extending portion of the nozzle plate 5, the spinning nozzles opening away from the cavity;

a separating plate 4 received in the cavity 22 and attached to the second major surface of the distributing plate 3, the separating plate 4 having a lower part of the nearly V-form crosssection and having separation grooves 17a, b engraved from both the side portions to a bottom portion of the lower part, facing the plurality of holes 14 of the nozzle plate 5, for introducing the different spinning resins into the plurality of holes; and

a clearance-defining plate 6 having a V-shaped groove for receiving the downwardly-extending portion of the nozzle plate 5 therein, the clearance-defining plate 6 being arranged to provide a gas-introducing clearance 16 between the nozzle plate 5 and the clearance-defining plate 6 for stretching the combined resins using the introduced gas as the combined resins emerge from the spinning nozzles 15.

The combined filaments type, melt-blow spinneret device 1 of the present invention is composed mainly of a nozzle plate 5 having an inner cavity 22 engraved therein and a spinning resin-introducing hole 14 and a spinning nozzle 15 bored successively at the bottom surface X of the inner cavity 22; a separating plate 4 for separating the respective spinning resins and leading them into the above spinning resin-introducing hole 14, and a clearance 16 for spouting a gas, formed toward the exit of the spinning nozzle 15.

The diameter of the spinning resin-introducing hole 14 may be the same as that of the spinning nozzle 15.

The separating plate 4 and the nozzle plate 5 are fixed by bolts 11, to a spinning resins-feeding device 2 separately feeding two kinds of spinning resin onto the spinning resins-feeding side of the nozzle plate 5.

The spinning resins-feeding device is for example composed of a spinning resin-feeding plate 2 having spinning resins-introducing grooves 7a, 7b having spinning resins A and B respectively supplied thereinto, engraved therein, and a distributing plate 3 for uniformly distributing the spinning resins A and B fed via the spinning resins-feeding plate 2.

The spinning resins grooves 7a, 7b are engraved in a groove-form in the spinning resins-feeding plate 2, and the discharge ports are broaden toward the end and are made so as to accord with the distributing grooves 13 of the distributing plate 3.

The spinning resins-feeding plate 2 may be an integral material, but in the case of this figure, it is divided into three members of a left member, a central member and a right member on the drawing, which are fixed with bolts (not shown).

The distributing plate 3 has distributing grooves 9a, 9b engraved in the length direction, that is, in the front and rear directions referred to in Fig. 1. Further, a number of distributing holes 8a, 8b are bored at the bottoms of the distributing grooves 9a, 9b. The distributing grooves 9a, 9b are fitted with filters 10, and the bottoms thereof also function as members for supporting the filters. The filters may be provided on the spinning resin-discharge ports of the distributing plate 3 or on the spinning resin-discharge port of the spinning resin-feeding plate 2.

The inner cavity of the nozzle plate 5 is divided by the separating plate 4 arranged in the inner cavity into a left part and a right part on the drawing, to form two spinning resin-receiving grooves 13 and narrow clearances 12 and D1 on the side surface in the vicinity of the lower parts of the grooves 12 and at the bottom part of the inner cavity, respectively.

On the upper surface of the nozzle plate 5, an inner cavity is engraved in the length direction, that is, in the front and rear directions referred to in Fig. 1, and on the bottom surface X of the inner cavity, a spinning resin-introducing hole 14 and a spinning nozzle 15 are bored successively so that the respective central axes thereof can accord with each other.

The clearance-defining plate 6 is preferably made of two harf members provided under the downwardly-extending portion of the nozzle plate 5 as shown in Fig. 1.

In the above constitution, the respective spinning resins of component A and component B melt-extruded through two extruders are sent to the respective spinning resin-receiving ports by means of two gear pumps (not shown), and discharged into the distributing grooves 9a, 9b of the distributing plate 3 via the respective spinning resin-introducing grooves 7a, 7b. The respective spinning resins pass through the respective spinning resin-receiving grooves 13 and the left and right separating grooves 17a, 17b of

the separating plate 4, further pass through the spinning resin-introducing holes 14 and are spun through spinning nozzles 15. Separating grooves 17a, b may be engraved only on the bottom surface of the separating plate 4 and a separating partition wall may be formed, and further they may be engraved from the side surface to the bottom surface of the separating plate 4. The widths of the separating grooves 17a, b may be the same as the diameter of the spinning resin-introducing hole 14, or may be broader or narrower than that, and a part of the separating grooves 17a, b may overlap with a part of the spinning resin-introducing hole 14, and further, the respective spinning resins may be sufficient to be separately led into the spinning resin-introducing hole 14.

In the spinneret device of the present invention, the bottom surface X of the inner cavity of the nozzle plate 5 is abutted onto the bottom surface K of the separating plate 4 i.e. the separating partition wall 19, or not abutted, but forms a narrow clearance D1 between them. Further, the side surface M of the radiant-shape part in the nearly V-form formed in the lower part of the separating plate 4 is abutted to the side surface Y in the nearly V-form of the lower part of the cavity of the nozzle plate 5, or not abutted, but forms a narrow clearance W3 between them. In the case where there is a clearance on the bottom surface or the side surface or both the surfaces, the side surface and the bottom surface are not injured at the time of constructing the spinneret device. The clearances W3 and D1 are preferred to be about 0.1 to 10 mm. If the clearances are less than 0.1 mm or they are abutted, there is a fear that the side surface and the bottom surface are injured at the time of construction of the spinneret device. Thus, a sufficient caution is necessary. If the clearances exceed 10 mm, as the moving speed of the spinning resins therethrough becomes very slow, an abnormal thermal decomposition or carbonization of the spinning resin, an abnormal pressure fluctuation, etc. at the spinning resin-introducing hole are liable to occur.

The diameter W2 of the spinning resin-introducing holes 14 bored in the nozzle plate 5 is preferred to be about 0.25 to 5 mm in that the productivity is improved as the number of holes can be increased and the mixing of the respective components is prevented. The diameter of the spinning nozzles 15 is preferred to be about 0.1 to 2 mm in that microfine filaments having an even fineness can be obtained. The L/D of the spinning nozzles is preferred to be 3 or more, and it is more preferred to be 5 to 20, taking the flow-controlling effect of the spinning resin and the accuracy of bore-processing into account. The spinning nozzles are bored at a distance of about 0.5 to 10 mm. Further, the diameter of the spinning nozzles may be the same as that of the spinning resin-introducing holes, and may have various kinds of an odd-shaped cross-section.

The separating plate 4 is fixed onto the distributing plate 3 at its top part 20. As to the separating plate 4, the upper part element thereof is abutted onto the lower part element through the abutted part 21 and fixed with bolt 11. The separating plate 4 has separating grooves 17a, 17b engraved from the side surface to the bottom surface thereof. There is a separating partition wall 19 between the grooves (see Fig. 3 to 7). The separating plate 4 may be made of an integral material.

Figs. 3 to 6 respectively show a schematic view illustrating the relationship between the bottom surface of the separating plate 4 and the bottom surface of the inner cavity of the nozzle plate 5. The separating grooves 17a, 17b are engraved so that the width W1 thereof can be larger than the diameter W2 of the spinning resin-introducing holes 14. Still further, the groove is engraved so that the introducing holes 14 can be completely covered with the groove at the bottom surface of the nozzle plate 5, that is, so that the lengths in the upper and lower directions and in the left and right directions of the grooves 17a, b on Fig. 3 can become larger than those of the introducing holes 14.

As to the separating grooves 17a, 17b in the case where the combined filaments proportions is 1/1 in terms of the ratio of numbers of nozzles, the grooves are engraved alternately each in one as seen in Fig. 3, or each in two as seen in Fig. 5, or each in three or more, or each in the same or almost the same number on the left and right sides of the nearly V-form of the separating plate. Further, in the case where the proportion is 2/1, the grooves are engraved in a proportion of each in two on the left side and each in one on the right side, as seen in Fig. 4. The separating grooves may be sufficient in one per one of the spinning resin-introducing holes 14, but the grooves may be engraved in one per two or more spinning resin holes, as seen in Fig. 6.

In the schematic view of the side surface (in the length direction) of the separating plate 4, as shown in Fig. 7, the respective separating grooves 17a, 17b are not particularly limited in the length. The grooves may be engraved only in the vicinity of the nearly V-form part of the separating plate, or may be extended onto the upper part thereof toward the spinning resin-receiving groove. In this case, the width and depth of the grooves 17a, 17b may be changed from those on the bottom surface.

The spinning resin-receiving grooves 13 constituted by the clearance between the outer wall of the separating plate 4 and the inner cavity wall of the nozzle plate 5 is extended in the length direction of the nozzle plate 5, and liable to cause a pressure unevenness in the length direction of the spinning plate 4 (extrusion unevenness directed to each spinning nozzle), when the spinning resins flow down through the grooves, which may result in fineness unevenness,

but by providing the separating grooves 17a, 17b, a uniform resin pressure can be maintained, thereby occurrence of fineness unevenness can be prevented.

The width W1 of the separating grooves are preferably about 0.26 to 10 mm. In the case where one separating groove per two or more spinning resin-introducing holes is engraved, the width may be one in which the spinning resin-introducing hole is completely covered, that is, 10 mm or more.

The depth D2 of the separating grooves in preferably about 0.1 to 10 mm, more preferably about 0.2 to 7 mm. When such a range is given, the spinning resins flow through the grooves and led to the spinning nozzles 15 at a moderate speed, whereby abnormally high speed or to the contrary, abnormally slow speed of the flowing resins is prevented, to cause no abnormal thermal decomposition, etc. of the resins.

Further, the grooves 17 may be different in the depth, on the left side and the right side of the nearly V-form or/and at the upper part and the lower part thereof. For example, in the case where a polymer having a relatively high viscosity is used, it is preferable to engrave the grooves deeply on the side thereof where it is introduced, and to the contrary in the case where a polymer having a low viscosity is led, it is preferable to engrave the grooves shallbwly on the side thereof where it is introduced.

The separating partition-wall 19 provided between the respective separating grooves 17a, 17b of the separating plate 4, when the respective bottom surfaces are abutted to the bottom surface of the nozzle plate 5, completely prevents the mixing of the polymers of the component A and the component B with each other, to effect a combined filaments type, melt-blow spinning of two different kinds of resins with each other. Further, even in the case where there is a narrow clearance D1, if the clearance is relatively small, combined filaments of single components with each other wherein the respective polymers are not mixed with each other as described above are obtained. However, in the case where the clearance D1 is relatively large, there are obtained combined filaments forming side-by-side, conjugate filaments wherein the respective polymers led from the right side and the left side are alternately different in the component ratio, in the vicinity of the spinning resin-introducing holes 14 at the bottom surface.

Further, when the width and depth of the separating grooves 17a, 17b and the clearance between the outer wall of the separating plate 4 and the inner cavity of the nozzle plate 5 are set to optional sizes in the length direction, it is possible to obtain optional combined filaments such as those of single component filaments or those of side-by-side type, conjugate filaments having different conjugate proportions of two components, those of side-by-side type, conjugate filaments having a small conjugate proportion of two components, with side-by-side type, conjugate filaments having a large conjugate proportion of two components.

As to the separating plate, it is very easy to engrave the groove 17, as compared with hole processing, and the plate can be prepared at a cheap cost. Thus, when several separating plates having different number or width of separating grooves on the left and right side of the nearly V-form thereof are provided, it is possible to easily prepare microfine filaments having no fineness nuevenness, filament aggregate, etc. even in the case of preparation of filaments having different filament-combining proportion and polymers having different viscosity, etc., and only by way of exchanging the separating plates.

The gas-spouting clearance 16 is formed between a clearance-defining plate 6 provided around the nozzle plate 5, and the nozzle plate 5. Unstretched filaments extruded through spinning nozzles 5 are blown by spouting a high temperature and high pressure gas led through a gas introducing-port 18 through a gas-spouting clearance 16, and collected in the form of a microfine filament web by means of a collecting device provided under the spinning nozzle plate. As the spouting gas, an inert gas such as air, nitrogen gas, etc. is used, the temperature and the pressure of the gas is about 100° to 500°C and about 0.1 to 6 Kg/cm^2.

The cross-section of the combined filaments obtained according to the device of the present invention is schematically illustrated by Figs. 8A, 8B and 8C. Fig. 8A illustrates microfine filaments wherein A component filament 23 has been completely separated from B component filament, which includes the case where the bottom surface of the separating plate 4 is abutted on the bottom surface of the inner cavity of the nozzle plate, as well as the case where there is a relatively narrow clearance D1 between the above surfaces. The resulting combined filaments are those obtained by preventing mixing of the respective polymers led from the left side and the right side of the nearly V-form in the vicinity of the inlets of the spinning resin-introducing holes 14. Fig. 8B refers to combined, microfine filaments of side-by-side type conjugate filaments different in the conjugate ratio of A component/B component. The combined filaments are obtained by using the separating plate having the separating grooves alternately engraved on the both sides of the nearly V-form so as to give the same size of the width or/and the depth of the grooves in the length direction and in the width directions, providing a relatively large size to the narrow clearance D1 and using polymers having a relatively small viscosity difference. Fig. 8C refers to combined microfine filaments of two kinds of single component filaments with side-by-side type conjugate filaments having different conjugate proportions of A component/B component. The combined filaments are obtained by

using the separating plate having the separating grooves alternately engraved in the length direction so as to give optionally different size(s) to the width or/and the depth of the grooves, making the size of the narrow clearance D1 intermediate one between those in the cases of Fig. 8A and Fig. 8B, and using polymers having a relatively small viscosity difference. In addition, in the case where the viscosity difference is relatively large, conjugate filaments either one of which are in the form of half moon are obtained.

Further, according to the melt-blow spinneret device of the present invention, spinning may be carried out not only in the vertical direction, but also in an optional direction such as in the horizontal direction.

The filaments obtained by the device of the present invention may be used as they are, or for various applications, such as web, non-woven fabric, etc., by subjecting them to modification treatment such as corona discharge treatment, hydrophylic treatment, treatment with antibacterial agent, or by blending or laminating other filaments, or melt-adhering at least one of the component filaments by heating.

Effectiveness of the Present Invention

As the melt-blow spinneret device of the present invention is provided with a nozzle plate and a separating plate for combined filaments, which is easily removable, it is possible to easily obtain optional microfine, combined filaments corresponding to the use applications. Further, even when the viscosity, the spinning temperature, etc. are varied to some extent, it is possible to choose a device having an optimum flow-adjusting function; thus it is possible to obtain microfine, combined filaments having few fineness unevenness and being stabilized, and also it is possible to correspond to a broad range of combined filaments type, melt-blow spinning of various kinds of spinning resins in an optional ratio of combined filaments. Further, it is unnecessary to manufacture conventional expensive nozzle plate, but it is sufficient to exchange only the separating plate for various kinds of combined filaments. Further, when a separating plate which can be divided into an upper member and a lower member, manufacture of a spinneret device is easier and cheaper.

Since the nozzle plate affords a stabilized spinning and its manufacture is easy, many spinning nozzles can be bored, and the width of the plate can be increased; hence a device having a high productivity can be provided.

In the case of a device wherein the separating plate and the nozzle plate are arranged so as to have narrow clearances at the bottom surface and the side surface, both of the nozzle plate and the separating plate are not damaged, but they can be repeatedly used for a long time.

Claims

1. A spinning device for melt-blow spinning, comprising:

   a spinning resin-feeding plate (2) having respective resin-introducing grooves (7a, 7b) for introducing two kinds of spinning resins;

   a distributing plate (3) attached to the spinning resin-feeding plate (2) and having a first major surface abutting a major surface of the spinning resin-feeding plate (2), said distributing plate (3) having distributing grooves (9a, 9b) for respectively distributing the spinning resins (A, B) fed from the resin-introducing grooves of the spinning resin-feeding plate;

   a nozzle plate (5) fixed to the distribution plate (3) and having a first surface abutting a second major surface of the distributing plate (3), said nozzle plate (5) having a cavity (22) for receiving a separating plate (4) therein and a plurality of holes (14) formed in a bottom interior surface of a downwardly-extending portion of the nozzle plate (5), said holes (14) opening towards the cavity and respectively communicating with a like plurality of spinning nozzles (15) formed in the downwardly-extending portion of the nozzle plate (5), said spinning nozzles opening away from the cavity;

   a separating plate (4) received in the cavity and attached to the second major surface of the distributing plate (3), said separating plate (4) having a lower part of nearly V-form cross-section and having separation grooves (17a, 17b) engraved from both the side portions to a bottom portion of said lower part, facing the plurality of holes (14) of the nozzle plate (5), for introducing the different spinning resins into the plurality of holes;

   a clearance-defining plate (6) having a V-shaped groove for receiving the downwardly-extending portion of the nozzle plate (5) therein, said clearance-defining plate (6) being arranged to provide a gas-introducing clearance (16) between the nozzle plate (5) and the clearance-defining plate (16) for stretching the combined resins using the introduced gas as the combined resins emerge from the spinning nozzles (15).

2. A spinneret device for melt-blow spinning according to claim 1, wherein the diameter of said spinning resin-introducing hole (14) is the same as that of said spinning nozzle (15).

3. A spinneret device for melt-blow spinning according to claim 1, wherein said separating plate (4) is divided into an upper member and a lower member, the side surface and bottom surface of said lower member being provided with said sep-

arating grooves (17a, 17b).

4. A spinneret device for melt-blow spinning according to claim 1, wherein said separating plate (4) is provided with a bottom surface having said separating grooves (17a, 17b) engraved, said separating grooves having a width broader than the diameter of said spinning holes (14).

5. A spinneret device for melt-blow spinning according to claim 1, wherein said separating plate (4) is provided with a bottom surface having separation grooves (17a, 17b) engraved, said separating grooves having a width enough to cover two or more of said spinning holes (14).

6. A spinneret device for melt-blow spinning according to claim 1, wherein at least one of said separating grooves (17a, 17b) provided on both the side portions of the nearly V-form of the lower part of said separating plate (4), has different width and/or depth from at least one of the other grooves.

7. A spinneret device for melt-blow spinning according to claim 1, wherein said separating plate (4) is provided so that the bottom surface thereof is abutted on the bottom surface of the inner cavity of said nozzle plate.

8. A spinneret device for melt-blow spinning according to claim 1, wherein said separating plate (4) is provided so that the side surface thereof is abutted on the side surface of said inner cavity of the nozzle plate (5).

9. A spinneret device for melt-blow spinning according to claim 1, wherein said separating plate (4) is provided so that a narrow clearance is provided between the bottom surface thereof and the bottom surface of the inner cavity of said nozzle plate (5).

10. A spinneret device for melt-blow spinning according to claim 1, wherein said separating plate (4) is provided so that a narrow clearance is provided between the side surface thereof and the side surface of the inner cavity of said nozzle plate (5).

FIG. 1

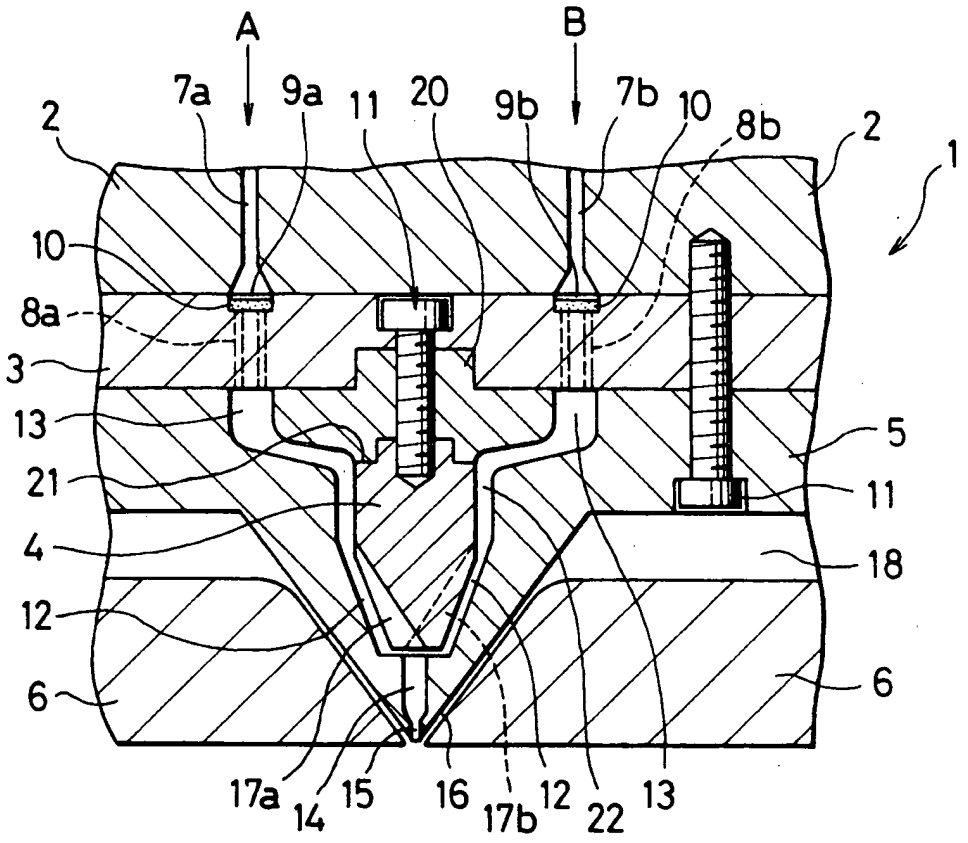

A
B
7a
9a
11
20
9b
7b
10
8b
2
2
1
10
8a
3
13
21
4
12
6
5
11
18
6
17a
14
15
16
17b
12
22
13

FIG. 2

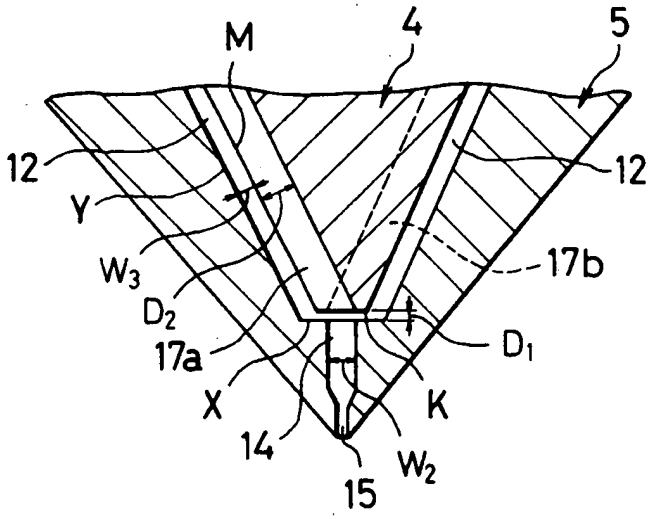

M
4
5
12
12
Y
W3
D2
17a
X
14
15
W2
K
D1
17b

FIG. 3

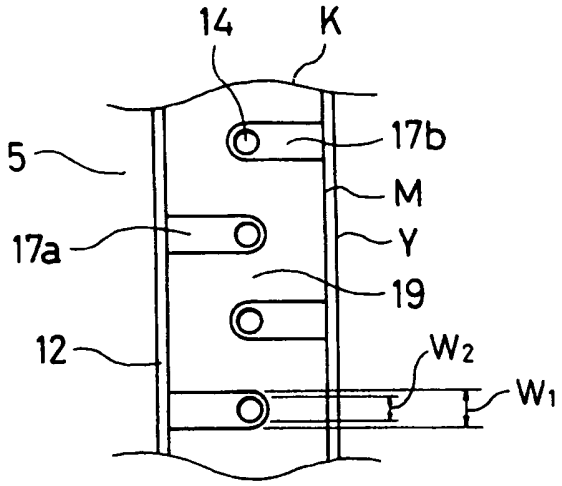


FIG. 4

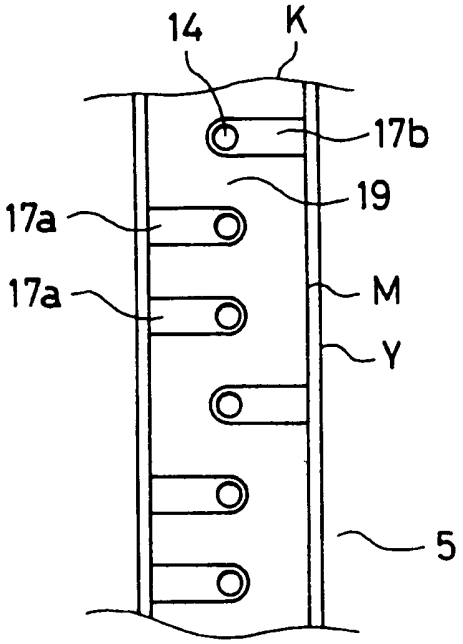


FIG. 5

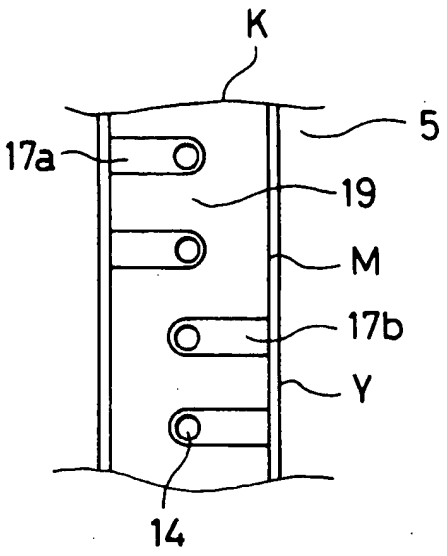


FIG. 6

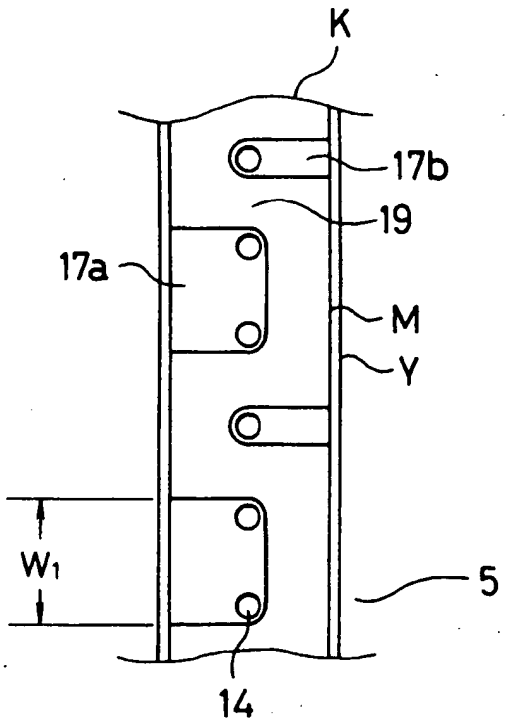


FIG. 7

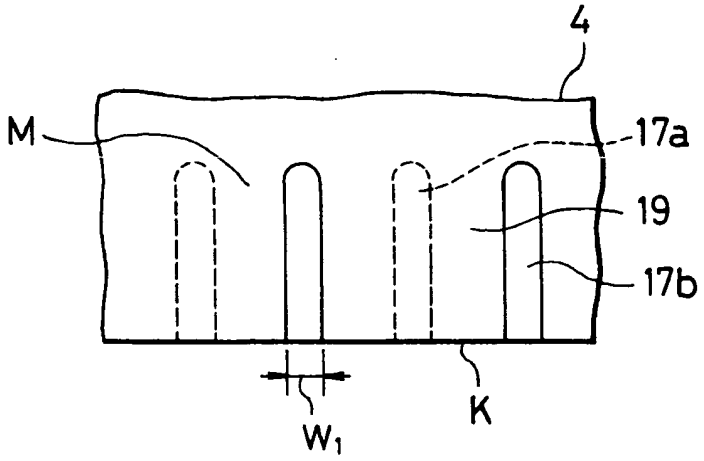


FIG. 8A

FIG. 8B

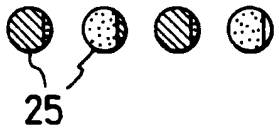


FIG. 8C

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 7254

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US-A-3 981 650 (ROBERT E. PAGE) ---		D01D4/02 D01D5/098 D01D5/32
D,A	DATABASE WPI Section Ch, Week 9305, Derwent Publications Ltd., London, GB; Class A, AN 93-042679 & JP-A-4 370 210 (NIPPON VILENE KK) 22 December 1992 * abstract * ---		
P,A	DATABASE WPI Section Ch, Week 9428, Derwent Publications Ltd., London, GB; Class F, AN 94-230832 & JP-A-6 166 945 (NIPPON VILENE KK) 14 June 1994 * abstract * ---		
A	EP-A-0 561 612 (CHISSO CORPORATION) -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) D01D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 January 1995	Tarrida Torrell, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)